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PATENT SPECIFICATION

DRAWINGS ATTACHED

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No. 25609/57.

(Patent of Addition to No. 809,821 dated Aug. 8, 1955).

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COMPLETE SPECIFICATION

Improvements in or relating to Apparatus for the Heat Treatment of Moving Material such as a Textile, Paper or the like in Web, Sheet or Strip Form

We, THE SPOONER DRYER & ENGINEERING CO. LIMITED, a British Company, of Moorland Engineering Works, Railway Road, Ilkley, Yorkshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention concerns apparatus for the heat treatment of moving material such as woven or a non-woven fabric material, and is an improvement in or modification of the invention set forth in our co-pending Patent Application No. 23516/54 (Serial No. 809,821).

20 Patent Application No. 23516/54 (Serial No. 809,821) concerns an apparatus which is particularly suitable for the polymerising of resins previously applied to moving material such as a textile, paper or the like, in web, sheet or strip form, and in that patent application there is described and claimed an apparatus comprising two chambers through which the material is caused to pass in succession, with means for guiding the material in a given path through the first chamber and thence into the second of said chambers, and in a further given path in said second chamber, means in the first chamber for directing a heated gaseous medium such as air in a plurality of streams or jets on to the moving material perpendicularly or at a substantial angle thereto for heating said material to or near to a temperature required for polymerisation, and means for circulating a heated gaseous medium in a substantially closed circuit in said second chamber to maintain the material in a slowly moving atmosphere of said gaseous medium at approximately the required temperature for

the necessary period of time whilst passing therethrough.

The present invention seeks to provide, as a modification of the invention described and claimed in Patent Application No. 23516/54 (Serial No. 809,821), a heat treatment apparatus which is suitable for handling not only woven fabrics and non-woven fabrics which are already in a self-supporting condition, but which is further capable of initially forming such non-woven fabrics, in addition to effecting subsequent heat treatment thereof such as the polymerisation of resins or vulcanisation of latex therein.

According to the present invention, therefore, an apparatus for the heat treatment of moving material such as textile, paper or the like in web, sheet or strip form and having synthetic resin or latex thereon or incorporated therein comprises a first chamber, conveyor means for transporting the material through said first chamber along a horizontal path therein and into a second chamber, means in the first chamber for directing a heated gaseous medium such as air in a plurality of streams or jets towards the conveyor means to impinge on the material perpendicularly or at a substantial angle thereto, and to heat said material to or near to a temperature required for polymerisation or vulcanisation, means in the second chamber for guiding the material in a given path therethrough, and means for circulating in a substantially closed circuit in said second chamber a heated gaseous medium at substantially or above said required temperature for the necessary period of time whilst passing through said second chamber.

Preferably the first chamber is itself of generally horizontal construction, with horizontal conveyor means such as a conveyor

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belt extending therethrough at least as far as the commencement of the path along which the material is guided in the second chamber, and defining the aforementioned horizontal path. The horizontal first chamber may conveniently comprises a plurality of adjoining sections each having individual means for circulating a heated gaseous medium such as air in a continuous, substantially closed circuit including a portion wherein said medium is directed in the form of streams or jets to impinge on to the moving material carried by the conveyor means. Preferably the individual circulating means in the horizontal sections of the first chamber are adapted to subject the gaseous medium to a variable degree of preheat, and the arrangement may conveniently be such that only in the section immediately preceding the second chamber is the material finally heated to a temperature of the order of that prevailing in the second chamber.

It will be apparent from the foregoing that moving material such as a textile material, paper or the like in web, sheet or strip form may readily be fed to the conveyor means in the first chamber for passage through the apparatus. Where the conveyor means is a conveyor belt, such web, sheet or strip material is simply fed to the conveyor belt to lay on the upper run thereof, whereafter it is conveyed successively through the first and second chambers, having its temperature raised in the first chamber substantially to that required for polymerisation or vulcanisation of any applied resin or latex dressing or the like.

In an important embodiment of the invention, however, the conveyor means in the first chamber comprises a conveyor belt, the front end of which is extended forwardly of said first chamber to provide a portion accessible externally of the latter. Associated with this forwardly extended portion of the conveyor belt are means for laying thereon an even bed of carded fibres of natural or synthetic material, for example fibres obtained from natural or synthetic textile materials, or glass fibres, and further means are provided for spraying the fibre bed with synthetic resins or with latex. The fibres, thus carded and sprayed, pass through the first chamber and are dried into a condition where there is formed a non-woven cohesive web or the like having sufficient strength to be self-supporting when removed from the conveyor. This self-supporting web is then passed from the first chamber into the second chamber, and is maintained therein at a temperature effective to cause polymerisation or vulcanisation, as the case may be, to take place. The production of a non-woven material in the manner described may be carried out particularly conveniently in that embodiment of the invention which utilises a sectional first chamber;

since in such apparatus the sprayed material may be dried in successive stages in the earlier sections of the first chamber, and its temperature may then be approximated in the last of the sections to that obtaining in the second chamber.

As described in Patent Application No. 23516/54 (Serial No. 809,821), the moving material may conveniently be guided through a moving or stationary zig-zag path in the second chamber defined respectively by means of power driven rollers arranged in two spaced, parallel sets and over and under which the material is arranged to pass, or by means of spaced bar members interconnected by way of a pair of spaced, substantially parallel chains driven either continuously or in step by step manner, and over which the material is caused to festoon. Thus a relatively long length of material may be accommodated in a chamber of given size.

The invention will be described further, by way of example, with reference to the accompanying drawing, which is a diagrammatic side elevation, partly in section, of one apparatus constructed in accordance with the invention.

A first chamber generally designated 1 comprises a plurality of generally horizontal, adjoining sections 2, 3, 4 and 5, the latter section in turn adjoins and opening into a second chamber 6. Through both chambers there passes a conveyor belt 8 on which material which is to be subjected to heat treatment is arranged so as to be carried through the chamber 1, and on either side of the portion of the upper run of the conveyor belt 8 in each of the sections 2, 3, 4 and 5, there is located a duct 9 opening into distributing nozzles 10 adapted to direct heated air for impingement on the belt 8 and the material arranged thereon. Each duct 9 comprises a continuous path for heated air, which is caused to circulate through said duct by fans 11, said path constituting an air circuit which is substantially closed except for means for the intake of make-up air. Each duct may incorporate, in association with the fan therein, a preheater (not shown) through which is passed air extracted from the main body of the section 2, 3, 4 or 5 concerned, said air then being passed by the fan into and through the duct for distribution by the nozzles 10.

The second chamber 6, substantially as described in Patent Application No. 23516/54 (Serial No. 809,821), will be seen to include a plurality of power driven rollers 12 arranged in two spaced parallel rows, beneath the lower of which is provided a hot air distributing duct 13 opening into nozzles 14. The material emerging from the last section 5 of the chamber 1 is passed over idler rollers 15 and under and over the rollers 12 to travel in a zig-zag path thereon, during which time it is held for an extended period of time at an elevated temperature determined by the tem-

perature of the air distributed from the nozzles 14, and effective to cause polymerisation or vulcanisation to take place of the dressing in the moving material. The duct 13 forms a part of a heated air circuit 16 through which air extracted from the main body of the chamber 6 is forced by a fan 17, passing in its travel through pre-heaters 18 provided to maintain the temperature in the chamber 6 at the required value. The material leaves the chamber 6 at 19.

The degree of pre-heat imparted to the air circulated by the fans 11 in the sections 2, 3, 4 and 5 of the first chamber 1 is conveniently variable, so that gradual stepwise increase in temperature may be effected of the material carried on the conveyor belt 8, the temperature of the said material being brought only in the last section 5 to or near to the polymerising or vulcanising temperature prevailing in the chamber 6. This feature of the invention is particularly useful where the apparatus is required to be employed for the production of a non-woven material, as opposed simply to the heat treatment of resin dressings in woven material. In the production of a non-woven material, carded bristles, such as hog's hair, or carded fibres of natural or synthetic textiles, for example obtained from rags, are fed at 20 on to the forward end of the conveyor belt 8a extending externally of the chamber 1, so as to form an even bed of desired thickness. Above the end 8a of the conveyor belt, there is arranged a distributor 21 for spraying the fibres with a synthetic resin material or with latex, dependent upon the nature of the material ultimately required, and the sprayed fibres are then carried into the chamber 1. The temperature of the air directed from the nozzles 10 on to the sprayed fibres in the sections 2, 3 and 4 is controlled to effect drying of the fibres in such a manner that drying is substantially completed by the time the belt leaves the section 4, and the last section 5 is employed to elevate the temperature of the now cohesive material on the belt to or near to the polymerising or vulcanising temperature obtained in the chamber 6. The material leaving the section 5 of the first chamber 1 is of sufficient strength to be self-supporting, and passes over the pulleys 15 to be guided in the chamber 6 through the zig-zag path defined by the rollers 12, in which path it is held at an elevated temperature for an extended period of time appropriate to complete polymerisation or vulcanisation by the time the material leaves the chamber 6 at the point 19.

WHAT WE CLAIM IS:—

1. An apparatus for the heat treatment of moving material such as a textile, paper or the like in web, sheet or strip form and having synthetic resin or latex thereon or incorporated therein, comprising a first chamber,

conveyor means for transporting the material through said first chamber along a horizontal path therein and into a second chamber, means in the first chamber for directing a heated gaseous medium such as air in a plurality of streams or jets towards the conveyor means to impinge on the material perpendicularly or at a substantial angle thereto, and to heat said material to or near to a temperature required for polymerisation or vulcanisation, means in the second chamber for guiding the material in a given path therethrough, and means for circulating in a substantially closed circuit in said second chamber a heated gaseous medium adapted to maintain the material in a slowly moving atmosphere of said gaseous medium at or above said required temperature for the necessary period of time whilst passing through said second chamber.

2. An apparatus as claimed in Claim 1 in which the first chamber is itself of generally horizontal construction, and has horizontal conveyor means extending therethrough at least as far as the commencement of the given path in the second chamber.

3. An apparatus as claimed in Claim 1 or Claim 2 in which the belt means is a horizontally arranged conveyor belt.

4. An apparatus as claimed in any of Claims 1 to 3 in which the front end of the conveyor means is extended forwardly of the front end of the first chamber.

5. An apparatus as claimed in any of the preceding claims in which the first chamber comprises a plurality of adjoining sections each having means for circulating heated gaseous medium in a substantially closed path therein, said path including a portion wherein said medium is directed as a plurality of streams or jets towards the conveyor and to impinge on the material thereon, and said circulating means each including means for imparting to said gaseous medium a variable degree of preheat.

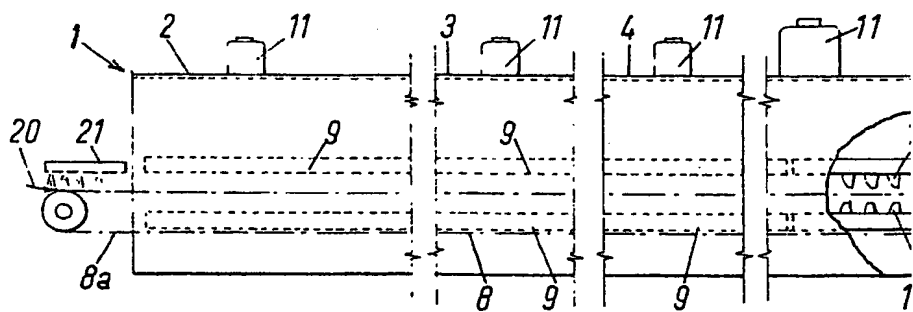
6. An apparatus as claimed in Claim 4 and 5 in which the front end of the conveyor means is extended forwardly of the first section of the first chamber, and has associated therewith means for laying a bed of carded fibres thereon, and means for spraying said fibres with a synthetic resin or latex, said resin or latex being dried in the sections comprising the first chamber to produce with said fibres a cohesive self-supporting material which is passed to the second chamber, and being held for an extended period in the latter at a temperature effective to cause polymerisation or vulcanisation respectively to occur.

7. An apparatus for the heat treatment of moving material having synthetic resin or latex thereon or incorporated therein, and constructed, arranged and adapted to operate substantially as hereinbefore described with refer-

ence to and as illustrated in the accompanying drawings.

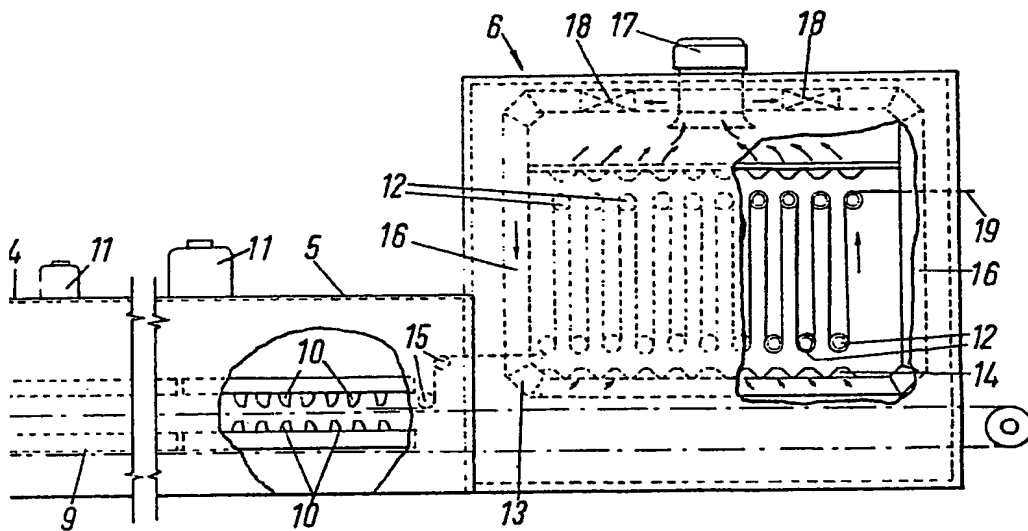
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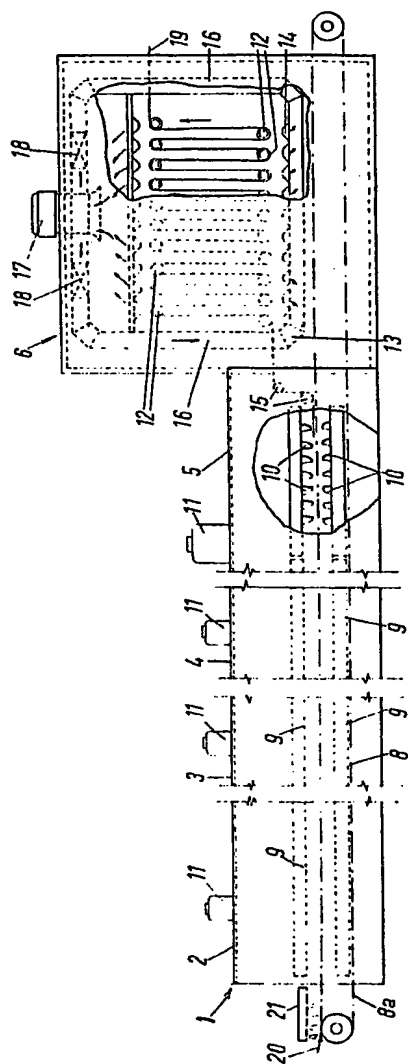
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